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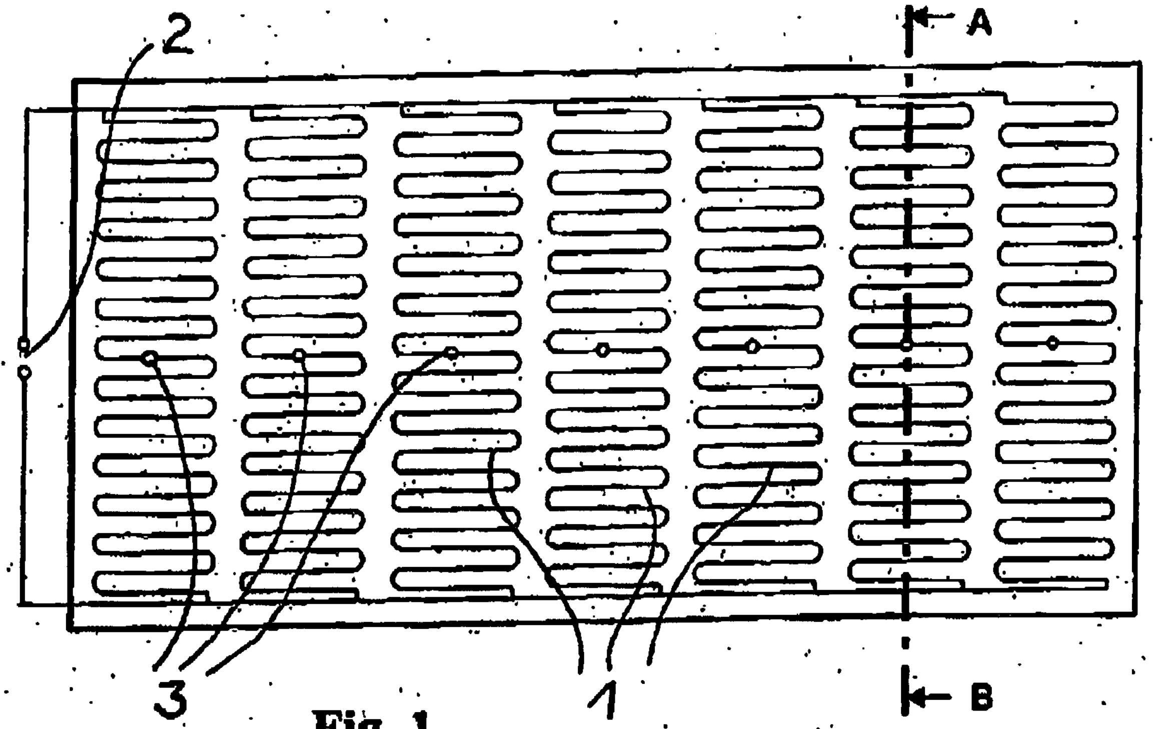

Fig. 1

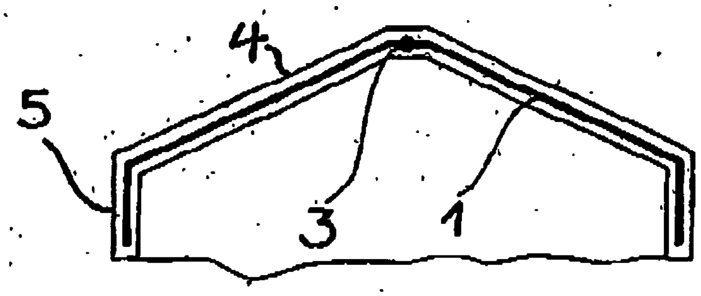

Fig. 2

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Method for regulating the temperature of an incubator hood

The invention relates to a method for regulating the temperature of an incubator hood for an incubator for prematurely and newborn infants.

Prematurely and newborn infants who are cared for in an incubator are particularly reliant on effective protection against heat losses. The causes of the heat losses may essentially be divided into four different categories, namely conduction, convection, evaporation and radiation. Conduction is defined as the conduction of heat from the surface of the body to the surface on which the prematurely or newborn infant is lying. Convection is defined as the emission of heat from the surface of the body to the air flow in the incubator surrounding the prematurely or newborn infant. Evaporation is defined as the evaporation heat which is generated on the body surface of the prematurely or newborn infant by the drying air flow in the incubator. Finally, radiation is defined as the heat radiation from the body surface of the prematurely or newborn infant to the colder surface of the incubator hood. In particular, the heat loss caused by radiation constitutes a considerable proportion of the total heat loss.

In US 5,119,467 it is described how this heat loss, caused by heat radiation from the body surface of the prematurely or newborn infant to the surface of the incubator hood, can be reduced. In this case a conductive coating is integrated as a heat radiation source into the incubator hood, which source is connected to a temperature regulating circuit. The temperature regulating circuit incorporates temperature sensors whose signals are used to control the electrical current source connected to the conductive coating. The fact that an expensive temperature regulation system, with temperature sensors and a control unit, is required for this, is shown to be a disadvantage of the incubator hood with conductive coating of prior art.

The object of this invention is to provide a method for regulating the temperature of an incubator hood for an incubator for prematurely and newborn infants whereby a desired temperature can be maintained by simple, reliable means.

The present invention is as claimed in the claims.

Heating lines connected to a voltage source pass through the incubator hood for an incubator for prematurely and newborn infants. Heating wires and temperature-dependent electrical resistances may be arranged in the heating lines. The heating wires may be thin and therefore only slightly limit the transparency of the incubator hood, comparable perhaps to the heating wires which are used for motor vehicle windscreens.

In the method for regulating the temperature of an incubator hood values of air temperature and relative humidity are first measured inside the incubator by means of measuring devices, which values are then transmitted to an evaluating and control unit which forms a value for the dew point temperature in the incubator from the measured values on the basis of physical laws. The temperature of the incubator hood is then regulated to a temperature value above the value formed for the dew point temperature by the evaluating and control unit and a suitably designed connection device with a voltage source, making use of heating wires of the heating lines which are connected to the voltage source and pass through the incubator hood. Preferably temperature regulation of the incubator hood should only be effected when the incubator hood is closed. This can be ascertained with suitable sensors, for example, and a suitable signal is then transmitted to the evaluating and control unit so that temperature regulation only takes place when the incubator hood is closed.

It has proved an advantage to connect the heating wires in parallel.

A spatially largely uniform temperature distribution, related to the incubator hood, is promoted particularly when the heating wires are distributed spatially uniformly over the incubator hood and that one of the temperature-dependent electrical resistances is arranged in each of the heating lines with its heating wires.

The incubator hood is heated to the desired temperature by applying a low voltage, amounting to a few volts, for example 30 volts, to the heating wires. The system formed by the heating wires is referred to in the following as surface heating. The temperature-dependent electrical resistances are preferably PTC resistances (positive temperature coefficient), which are known from a number of technical applications. The PTC resistances used here are characterised, for example, by a nominal response temperature of approximately 37°C. In the temperature range above this the resistance increases very sharply, so that at a predetermined voltage present at the voltage source the current flow and hence the resultant heating action are reduced. This guarantees a temperature regulation of the incubator hood to approximately 37°C. In this case the temperature of 37°C generally exceeds the dew point temperature of the air inside the incubator. The heating action of the heating wires in the surface heating is suitably adapted to the temperature characteristic of the PCT resistances used.

In addition to the reduced heat loss for the prematurely or newborn infant lying in the incubator, the fact that no condensation is formed on the incubator hood despite high air humidity inside the incubator is regarded as a further advantage of the incubator hood according to the invention. Condensation is always undesirable because firstly it obscures the view of the prematurely or newborn infant from the outside and secondly it favours the formation of bacteria inside the incubator.

A further advantageous design consists of an incubator hood which exhibits limiting faces that are vertical or are inclined to the horizontal, so that cloths and covers can be hung over it but the depositing of objects on the incubator hood is generally prevented. Covering with a cloth or cover is often useful for providing the infant in the incubator with rest and darkness. The PCT resistances are arranged so that they are always also covered when the incubator is covered with a cloth or cover. For example, if the incubator hood is designed in the shape of a ridge roof, the PCT resistances are suitably arranged in the ridge of the roof so to speak. This prevents a build-up of heat inside the incubator.

The fact that the generation of heat inside the incubator no longer relies upon a hot air flow is also considered a significant advantage of the incubator hood: The flow rate and volumetric flow of the hot air can be reduced because the heated incubator hood is available as an additional heat source. A reduced flow rate results in lower noise development in the incubator, and a lower volumetric flow results in less evaporation on the body surface of the prematurely or newborn infant. Both effects are desirable.

In a preferred design of the method for regulating the temperature of the incubator hood heating lines are used in which are arranged temperature-dependent electrical resistances, for example PTC resistances, with heating wires.

The temperature value to which the temperature of the incubator hood is regulated is preferably approximately 1 to 2°C above the value of the dew point temperature previously formed by the evaluating and control unit.

Embodiments of the invention will be described by way of an example in the following with reference to the drawings, in which:

Figure 1 is a schematic plan view of an incubator hood with heating wires and temperature-dependent electrical resistances suitable for implementing the method of the present invention;

Figure 2 is a schematic section along line A-B of the hood of Figure 1.

Figure 1 shows an incubator hood with heating lines comprising heating wires 1 and temperature-dependent electrical resistances 3. A total of seven heating lines 1 are arranged in parallel, electrically. They are wound in uniform loops through the incubator hood. The heating lines are connected to a voltage source 2 arranged outside the incubator hood. A temperature-dependent electrical resistance 3 is arranged halfway along the length of each heating line between hearing wires 1.

Figure 2 shows the incubator hood shown in Figure 1 in the lateral cross-section along line A-B. The perpendicular side faces 5 and the top faces 4, inclined by approximately 30° to the horizontal in the manner of a ridge roof, are represented. One of the temperature-dependent electrical resistances 3 is shown on the ridge of the roof.

CLAIMS

1. A method for regulating the temperature of an incubator hood, including measuring the air temperature with a first measuring device and measuring the relative humidity inside the incubator with a second measuring device;

transmitting the measured values to an evaluating and control unit which forms a value for the dew point temperature in the incubator from the measured values; and

regulating the temperature of the incubator hood is to a temperature value above the value for the dew point temperature formed by the evaluating and control unit and by means of a connection device with a voltage source and with the use of heating lines which are connected to the voltage source and pass through the incubator hood.

2. The method according to claim 1, in which heating lines, in which temperature-dependent electrical resistances are arranged, are used for regulating the temperature.

3. The method according to claim 2, in which the temperature-dependent electrical resistances are PTC resistances.

4. The method according to one of the preceding claims, in which the heating lines are arranged so that they are distributed spatially uniformly in the incubator hood.

5. The method according to one of claims 1 to 4, in which the temperature of the incubator hood is approximately 1 to 2°C above the value for the dew point temperature.

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